

Sergio F. Breña

Associate Professor
Department of Civil and Environmental Engineering
University of Massachusetts Amherst

232A Marston Hall
Amherst, MA 01003-5205
Phone (413) 545-0349, Fax (413) 577-4940
e-mail: brena@ecs.umass.edu

Education

University of Texas at Austin
Doctor of Philosophy (Ph.D), Civil Engineering (Structures), 2000
Master of Science in Engineering (Structures), 1990

Universidad Iberoamericana (Mexico City)
B.S. in Civil Engineering, 1989

Academic Experience

Sept. 2006 – Present: Associate Professor, University of Massachusetts Amherst, Department of Civil and Environmental Engineering (Structures).
Sept. 2000 – Aug 2006: Assistant Professor, University of Massachusetts Amherst, Department of Civil and Environmental Engineering (Structures).

Classes taught:

CEE 365 – Civil and Environmental Engineering Laboratory
CEE433 – Reinforced Concrete Design
CEE536 – Advanced Topics in Reinforced Concrete
CEE590B – Introduction to Bridge Engineering
CEE646 – Seismic Structural Analysis
EDUC-791L-Engineering for Classroom Teachers: Civil & Environmental Engineering in our World

1991 – 1996: Adjunct Professor, Iberoamericana University – Mexico City, Mexico, Department of Civil Engineering.

Short Courses:

Agency: Precast/Prestressed Concrete Institute
Title: 1-day Basic Prestressed Concrete Design Seminar
Dates: 10/03/2007, 10/10/2007, 11/07/2007, 03/2009, 03/26/2009, 04/02/2009

Agency: Rhode Island Department of Transportation
Course: Overview of Rehabilitation Techniques using FRP Composites
Date: 13 February 2009

Professional Experience

1993 – 1996: HB Projects and Consulting (Mexico City, Mexico)

- Chief Design Engineer - Projects including the seismic rehabilitation of telephone buildings in Mexico, structural design of commercial and residential buildings.

1991 – 1993: Integral Consulting in Engineering (Mexico City, Mexico)

- Chief Design Engineer: Tunnel Design Area – Responsible for supervising design of tunnels, vertical shafts, pump houses, and other structures for the Mexico City deep drainage system and Metro.
- Design Engineer – Involved in the structural design of the seismic retrofit projects of existing reinforced concrete buildings for TELMEX (Mexican Telephone Company).

1987 – 1989: HB Construction Company (Mexico City, Mexico)

- Engineer –Construction bids, resident engineer.

Participation in Professional Organizations

American Concrete Institute, Fellow (2009)	Member 1990 – present; Fellow 2009
Secretary, Committee 369 – Seismic Repair and Rehabilitation Voting member, Committee 374 - Performance Based Seismic Design of Concrete Buildings Voting member (Board appointed), ACI Publications Committee Associate Member, Committee 440 - Fiber Reinforced Polymer Reinforcement Associate Member, ACI-ASCE Committee 445 – Shear and Torsion	
Precast/Prestressed Concrete Institute	Member 2003 – Present
Faculty Advisor, Big Beam Student Competition 2002 (Best report, 6 th place national), 2003 (5 th place national), 2007, 2010 Student Education Committee	
American Society of Civil Engineering	Member 1990 – Present
UMass-ASCE Student Chapter Faculty Advisor – 2003 through 2007 Concrete Canoe Competition Advisor – 2001 through 2007 (regional champions in 2004) Member of the ASCE/SEI Chile (Maule) Earthquake Reconnaissance Team – April 2010	
Earthquake Engineering Research Institute	Member 1990 - Present
Structural Engineering Institute (ASCE)	Member 1996 - Present
Mexican College of Civil Engineers	Life member
Boston Society of Civil Engineers	Member 2000 – Present
American Institute of Steel Construction	Member 2003 – Present

Awards and Honors

Iberoamericana University – B.S. Honorable mention (1989)
Mexican College of Civil Engineers – Awarded life membership (1989)
Texas Department of Transportation – 2000 innovator award
American Society of Civil Engineers (UMass student chapter) – 2005 faculty of the year award
American Concrete Institute
ACI Fellow (2009)
Concrete Research Council Research Fellowship (2009)
Precast/Prestressed Concrete Institute – Daniel P. Jenny Research Fellowship (2009-2010, 2010-2011)

Peer Reviewed Publications

Breña, S.F. and Roy, N.C., Closure to Discussion by D. Kumar Sahoo, B. Singh, and P. Bhargava of “Evaluation of Load Transfer and Strut Strength of Deep Beams with Short Longitudinal Bar Anchorages”, *ACI Structural Journal*, Vol. 107 (4), July-Aug 2010, pp. 491-493.

Breña, S.F., Fernández Ruiz, M., Kostic, N., and Muttoni, A., “Modelling Techniques to Capture the Backbone Envelope Behaviour of Coupling Beams Subjected to Seismic Loading”, *Studies and Researches: Annual Review of Structural Concrete*, Politecnico di Milano, Vol. 29, 2009, pp. 53-78.

Breña, S.F. and Ihtiyar, O., “Performance of Conventionally Reinforced Coupling Beams Subjected to Cyclic Loading”, *ASCE Journal of Structural Engineering*, submitted June 2009, in review.

Niemitz, C.W., James, R., and Breña, S.F., “Experimental Behavior of Carbon Fiber-Reinforced Polymer (CFRP) Sheets Attached to Concrete Surfaces using CFRP Anchors”, *Journal of Composites for Construction*, ASCE, Vol. 14 (2), March/April 2010, pp. 185-194.

Ahern, J., Jennings, L., Fenstermacher, B., Warren, P., Charney, N., Jackson, S., Mullin, J., Kotval, Z., Breña, S., Civjan, S., and Carr, E., “Issues and Methods for Transdisciplinary Planning of Combined Wildlife and Pedestrian

Highway Crossings”, *Transportation Research Record*, No. 2123, *Journal of the Transportation Research Board of the National Academies*, Washington, D.C., 129-136.

Kane, B. and Breña, S.F., “Forces and stresses generated during rigging operations”, *Arboriculture & Urban Forestry*, Vol. 35 (2): 68-74.

Breña, S.F. and Roy, N.C., “Evaluation of Load Transfer and Strut Strength of Deep Beams with Short Longitudinal Bar Anchorages”, *ACI Structural Journal*, Vol. 106 (5), Sept-Oct 2009, pp. 678-689.

Roy, N.C., and Breña, S.F., “Behavior of Deep Beams with Short Longitudinal Bar Anchorages”, *ACI Structural Journal*, Vol. 105 (4), July-August 2008, pp. 460-470.

Breña, S.F. and Morrison, M.C., Closure to 3 Discussions by E. de Souza Sanchez, J. Holtz Silva, and M.T. Gomes Barbosa; R.A. de Souza; and A. Muttoni, N. Kostic, and M. Fernandez Ruiz of “Factors Affecting Strength of Elements Designed using Strut-and-Tie Models”, *ACI Structural Journal*, Vol. 105 (2), March-April 2008, pp. 232-236.

Breña S.F. and Schlick B.M., “Hysteretic Behavior of Bridge Columns with FRP-Jacketed Lap Splices Designed for Moderate Ductility Enhancement”, *Journal of Composites for Construction*, ASCE, Vol. 11 (6), November-December 2007, pp. 565-574.

Breña S.F., Bonczar C.H., Civjan S.A., DeJong J.T., and Crovo D.S., “Evaluation of Seasonal and Yearly Behavior of an Integral Abutment Bridge”, *Journal of Bridge Engineering*, ASCE, Vol. 12 (3), May-June 2007, pp. 296-305.

Breña S.F. and Morrison M.C., “Factors Affecting Strength Calculation of Elements Designed Using Strut-and-Tie Models”, *ACI Structural Journal*, Vol. 104 (3), May-June 2007, pp. 267-277.

Civjan S.A., Bonczar C.H., Breña S.F., DeJong J.T., and Crovo D.S., “Integral Abutment Bridge Behavior: Parametric Analysis of a Massachusetts Bridge”, *Journal of Bridge Engineering*, ASCE, Vol. 12 (1), January-February 2007, pp. 64-71.

Breña S.F., Benouaich M.A., Kreger M.L., and Wood S.L., “Fatigue Tests of Reinforced Concrete Beams Strengthened using Carbon Fiber-Reinforced Polymer Composites”, *ACI Structural Journal*, Vol. 102 (2), March-April 2005, pp. 305-313.

Civjan S.A., Breña S.F., Butler D.A., and Crovo D.S. “Field Monitoring of an Integral Abutment Bridge in Massachusetts”, *Transportation Research Record (TRR)*, *Journal of the Transportation Research Board*, No. 1892, National Research Council, 2004, pp. 160-169.

Breña S.F. and Macri B. M., “Effect of Carbon-Fiber-Reinforced Polymer Laminate Configuration on the Behavior of Strengthened Reinforced Concrete Beams”, *Journal of Composites for Construction*, ASCE, Vol. 8 (3), May-June 2004, pp. 229-240.

Breña S.F., Wood S.L., and Kreger M.L., “Full-scale Tests of Bridge Components Strengthened using Carbon Fiber Reinforced Polymer Composites”, *ACI Structural Journal*, Vol. 100 (6), November-December 2003, pp. 775-784.

Breña S.F. and Steves, M.A., “Increasing the Flexural Capacity of an Existing Reinforced Concrete Bridge in Texas using CFRP Composites”, *Field Applications of FRP Reinforcement: Case Studies*, ACI Publication SP-215, 2003, pp. 203-218.

Breña S.F., Bramblett R.M., Wood S.L., and Kreger M.L., “Increasing the Flexural Capacity of RC Beams using CFRP Composites”, *ACI Structural Journal*, Vol. 100 (1), January-February 2003, pp. 36-46.

Peer Reviewed Conference Proceedings

Civjan, S.A., Kalayci, E., Breña, S.F., Allen, C.A., “Integral Abutment Bridge Monitoring Program in Vermont”, *2010 TRB Annual Conference*, Paper no. 10-2510, Washington, D.C.

Breña, S.F. and Alcocer, S.M., “Seismic Performance Evaluation of Rehabilitated Reinforced Concrete Columns through Jacketing”, *ATC & SEI 2009 Conference on Improving the Seismic Performance of Existing Buildings and Other Structures*, ASCE/ATC, December 9-11, 2009, San Francisco, CA, USA.

Sezen, H., Dragovich, J., Ghannoum, W., Lowes, L.N., Breña, S.F., and Elwood, K.J., “Guide for Seismic Rehabilitation of Concrete Buildings: Summary of Future Changes”, *ATC & SEI 2009 Conference on Improving the Seismic Performance of Existing Buildings and Other Structures*, ASCE/ATC, December 9-11, 2009, San Francisco, CA, USA.

Breña, S.F., Fernández Ruiz, M., and Muttoni, A., “Applications of Stress Fields to Assess the Behavior and Strength of Coupling Beams Subjected to Seismic Actions”, *3rd International fib Congress*, Washington, D.C., May 29- June 2, 2010, Paper no. 534.

Ahern, J., Jennings, L., Fenstermacher, B., Warren, P., Charney, N., Jackson, S., Mullin, J., Kotval, Z., Breña, S., Civjan, S., and Carr, E., “Issues and Methods for Transdisciplinary Planning of Combined Wildlife and Pedestrian Highway Crossings”, *2009 TRB Annual Conference*, TRB Paper Number: 09-0441, Washington, D.C. January 2009.

Kalayci, E., Breña, S.F., and Civjan S.A. “Curved Integral Abutment Bridges – Thermal Response Predictions through Finite Element Analysis”, *Structures Congress 2009*, ASCE, Austin, TX, April 2009, pp. 213-222.

Ihtiyar O. and Breña. S.F. “Assessment of FEMA 356 Techniques for Orthogonally Reinforced Coupling Beams through Experimental Testing, Research Frontiers: FEMA 356/440 & ASCE 41”, *2007 Structures Congress: New Horizons and Better Practices*, ASCE, Long Beach, CA, May 2007, 16 pp.

Ihtiyar O. and Breña S.F. “Force-Deformation Response of Conventionally Reinforced Coupling Beams: An Evaluation of FEMA 356”, *CD ROM Proceedings: 8th National Conference of Earthquake Engineering (8NCEE)*, San Francisco, CA, April 2006.

Gussenhoven R.B. and Breña S.F. “Fatigue Behavior of Reinforced Concrete Beams Strengthened with Different FRP Laminate Configurations”, *7th International Symposium on Fiber Reinforced Polymer Reinforcement for Reinforced Concrete Structures (FRPRCS7)*, ACI Special Publication SP-230, 2005, pp. 613-629.

Bonczar, C., Breña, S.F., Civjan, S.A., DeJong, J., Crellin, B., and Crovo, D. “Field Data and FEM Modeling of the Orange-Wendell Bridge”, *Proceedings: 2005 FHWA Conference: Integral Abutment and Jointless Bridges (IAJB 2005)*, Baltimore, MD, 17-19 March 2005, pp. 163-173.

Bonczar, C., Breña, S.F., Civjan, S.A., DeJong, J., and Crovo, D. “Integral Abutment Pile Behavior and Design – Field Data and FEM Studies”, *Proceedings: 2005 FHWA Conference: Integral Abutment and Jointless Bridges (IAJB 2005)*, Baltimore, MD, 17-19 March 2005, pp. 174-184.

Schlick, B.M. and Breña, S.F., “Seismic Rehabilitation of Reinforced Concrete Bridge Columns in Moderate Earthquake Regions using FRP Composites”, *CD-Rom Proceedings: 13th World Conference on Earthquake Engineering*, Vancouver, B.C., 2004.

DeJong J.T., Howey D.T., Civjan S.A., Breña S.F., Butler D.S., Crovo D.S., Hourani N., and Connors P. “Influence of Daily and Annual Thermal Variations on Integral Abutment Bridge Performance”. *American Society of Civil Engineers, GEO-Trans Conference*, Los Angeles, CA, 2004, pp.496-505.

Civjan S.A., Breña S.F., Butler D.A., and Crovo D.S. “Field Monitoring of an Integral Abutment Bridge in Massachusetts”. *CD-Rom Proceedings: Transportation Research Board (TRB) 2004 Annual Meeting*, Washington, D.C., 2004, Paper no. 04-4172.

Breña, S.F., Wood, S.L., and Kreger M.L., “Fatigue Tests of Reinforced Concrete Beams Strengthened using Carbon Fiber Reinforced Polymer Composites”, *Proceedings: Second International Conference on Durability of Fibre Reinforced Polymer (FRP) Composites for Construction*, Université de Sherbrooke, Sherbrooke, Canada, 2002, pp. 575-586.

Breña, S.F., Bramblett, R.M., Wood, S.L., and Kreger M.L., “Flexural Strengthening of Existing Reinforced Concrete Bridges Using Carbon Fiber Reinforced Polymer Composites”, CD Rom Proceedings: Structural Faults and Repair 2001, Engineering Technics Press, Edinburgh, U.K., 2001.

Breña, S.F., Unal, A., and Wood, S.L., “Seismic Response of Lightly - Reinforced Coupling Beams”, CD Rom Proceedings, *Sixth U.S. National Conference on Earthquake Engineering*, EERI, Seattle, Washington, 1998.

Research Reports

Jeffrey, A.E., Breña, S.F., and Civjan, S.A., “Evaluation of Bridge Performance and Rating through Non-destructive Load Testing”, *Report no. 2009-1*, Vermont Agency of Transportation, January 2009, 271 pp.

Breña S.F., Civjan S.A., and Goodchild M., “Advanced Composite Materials for New England’s Transportation Infrastructure: A Study for Implementation and Synthesis of Technology and Practice”, *Final Project Report: NETC 01-1*, New England Transportation Consortium, May 2006.

Bonczar, Christine H., Civjan, Scott A., Breña, Sergio F., DeJong, Jason, “Behavior of Integral Abutment Bridges: Field Data and Computer Modeling”, Final Report prepared for the Massachusetts Highway Department, June 2005.

Breña S.F., Bramblett R.M., Benouaich M.A., Wood S.L., and Kreger M.E., “Use of Carbon Fiber Reinforced Polymer Composites to Increase the Flexural Capacity of Reinforced Concrete Beams”, *Research Report # 1776-1*, Center for Transportation Research, University of Texas at Austin, 2001, 228 pp.

Breña S.F., Wood S.L., and Kreger M.E., “Increasing the Flexural Capacity of Typical Reinforced Concrete Bridges in Texas Using Carbon Fiber Reinforced Polymers”, *Research Report # 1776-2*, Center for Transportation Research, University of Texas at Austin, 2001, 266 pp.

Aguilar J., Breña S.F., Del Valle E., Iglesias J., Picado M., Jara M., and Jirsa J.O., “Rehabilitation of Existing Reinforced Concrete Buildings in Mexico City – Case Studies”, Ferguson Structural Engineering Laboratory, *Report No. PMFSEL 96-3*, 1996, 170 pp.

Expertise

Sergio F. Breña has years of experience in laboratory and field testing of structures and structural systems. Additionally, he has over six years of structural design experience in projects involving rehabilitation of existing buildings to improve earthquake performance and structural design of underground structures and tunnel liners, among others. His research interests include design and behavior of reinforced and prestressed concrete structures, use of fiber-reinforced materials in civil infrastructure applications, and field performance of bridges and buildings. Recent projects include investigations on the use of fiber-reinforced composites to strengthen existing reinforced concrete beams and columns, design and behavior of structural concrete elements using strut-and-tie models, earthquake performance of coupling beams, field performance of integral abutment bridges, and live-load testing of existing bridges. He has also served as advisor to student groups at the University of Massachusetts Amherst for several years. He served as faculty advisor to the ASCE student chapter from 2003-2007. Additionally, he directly advised students involved in the concrete canoe competition (ASCE) from 2002-2007 and the Big Beam competition (PCI) in 2002, 2003, 2007, and 2010. These student groups have won several regional and national awards in various categories.